

fungus and tissue were being removed. Again the beetle ceased feeding after approximately 20 minutes. After a period of nine days, the beetle had entirely removed the diseased portion of the tail, a volume of material estimated at one and three-fourths cubic cms. Close examination of the stump showed no fungus present. The beetle then moved to the smaller, more shallow areas of infection on the animal's body and removed the fungus and necrotic tissue from two of these. Both were circular, about one cm in diameter and involved only the outermost layers of the skin. Seemingly, such activity would cause the salamander some discomfort, but in every case it remained inactive while the beetle fed.

Cybister fimbriolatus is thought to be a predaceous beetle, feeding on small aquatic organisms of almost any type. In the situation just described, the aquarium contained many animals that were potentially food for the beetle. Among these were dragonfly nymphs, 14 fishes of six species (most less than one and one-half inches in length), two tadpoles, five newts, several small larval salamanders and numerous snails. At no time, as far as the writer could determine, did the coleopteran display any interest in any of these organisms.

Strict cleaner-client relationships are usually of such a nature that the client allows the cleaner to pursue its activities without molestation and remains motionless or almost so as the cleaner works. This seemed to be the case during these observations. When the writer touched infected areas with the finger or the end of a forceps, the amphibian either swam away or vibrated its body rapidly as if trying to shake off the offending object. No movements of this kind were noticed when the beetle was cleaning.

The foregoing observations are not indicative of a highly evolved cleaner-client relationship between these two species, but they do suggest that similar events may occur in nature. Other species of clients may be involved.

It is worthy of note that another smaller dytiscid, *Hydaticus bimarginatus* (Say), present in the tank, was never observed to engage in cleaning activities.

The writer wishes to thank Dr. Robert H. Mount and Dr. Hugh B. Cunningham for their critical reading of the manuscript and helpful comments.

ON THE NUMBER OF BEMBIDION SPECIES (COLEOPTERA, CARABIDAE) OCCURRING IN NORTH AMERICA

By CARL H. LINDROTH

In a review of Part 3 of my "Ground-Beetles of Canada and Alaska" Arnett (1965) gave the total for genus *Bembidion* in North America, according to our present knowledge, as "about 411 species." This figure was apparently obtained by adding the reportedly 16 new species described in my book (actually, there are 21) to the "about 395" mentioned by Ball (1960, p. 113).

It should, however, be taken into account: (a) that a vast number of specific names in this genus, notably among those given by Casey, have been synonymized since Ball made his estimate, and (b) that several species originally described from the Old World have since been discovered in North America.

Bembidion is the largest genus of carabid beetles both in Eurasia and North America and it is of some interest to make a fair calculation of the number of species existing—or at least known. As far as America north of Mexico is concerned, I would like to do this against an historical background showing the main steps of advancement towards a more complete knowledge.

Leconte (1848) listed 42 species of *Bembidion*, but 7 of these must be regarded as synonyms of other names contained in the same paper. The correct number of species is thus 35.—In his later catalogue (1857), Leconte increased the number to 75 species (plus some uninterpretable names given by the old authors); 6 of these are now regarded as synonyms. The correct number is thus 69 species, twice as many as he treated less than 10 years previously.

The monograph by Hayward (1897) meant considerable progress. Besides 13 unrecognizable older names, he treated 124 species of *Bembidion* (*rickseckeri* Hayw. not counted, because it is now placed in a separate genus). Only 4 of Hayward's names are clear synonyms; the correct number of his species is therefore 120.

Casey (1918, 1924) described an immense number of new species among the *Bembidiini*. They were presented (in 1918) according to his customary fashion, that is, exclusively in the form of keys, into which also the already known species were inserted, as far as familiar to him. Some were, however, mentioned only in the accompanying text, under the pertinent group, and, in subg. *Odontium*, Casey gave only additions to Fall's previous revision (1910). The number of species of *Bembidion* treated in Casey's keys is therefore lower than what was actually recognized by him. Nevertheless (in 1918 and 1924 together), the imposing figure of 372 species was reached, 274 of which were described as new (subspecies not counted).

Leng incorporated the Casey names of 1918 in his Catalogue (1920) and those of 1924 in the First Supplement (1927), and also included several older names, not or incompletely treated by Casey. The Leng figures are 373 and 429 species, respectively. The Supplements II-V (1933-48) only raised the number by 4, to 433: 12 new species had been described during this period but, at the same time, 8 older names had been synonymized.

When Ball (1960) made his estimate, reliable at the time, of "about 395" North American species of *Bembidion*, he considered the new species added after 1948, mainly by Hatch (1950, 1953), and also the synonymizations made by Hatch (1953) and by myself (1954, 1955). However, most of the synonymy, chiefly of Casey names, was not established until in my "Ground-Beetles" (Part 3, 1963).

The correct number of species known from different periods since Leconte, 1848, is shown in Table 1.

Concerning the present estimate, the following three points should be stressed:

(1) The number of catalogue names, not (or not yet) synonymized, of species of genus *Bembidion* in North America is 305.

(2) This figure includes, however, 96 Casey names which have not been revised and of which the main part no doubt are pure synonyms. A rough estimate of how many may be assumed to remain valid, could perhaps be made as follows: Of the 178 Casey names within the genus revised by me (1963, etc.), 150 have been synonymized. The 28 valid ones—some of which entered "by the back door," that is, in replacement of an old preoccupied or otherwise inapplicable name—constitute 16(15.7)% of the investigated names. In the Table (bottom line) this proportion has been applied to the 96 still unrevised Casey names; 81 have been assumed to be synonyms and 15 to be valid. This brings the number of known North American species down to ca. 224.

(3) Now, several species of *Bembidion* presumably remain to be discovered, above all in the southwestern mountains. To make even a guess at what a group of skilled collectors could achieve there, and elsewhere, would be futile. If the necessary field-work is carried out before the end of the century and if, at the same time, the remaining Casey names have been revised, it seems likely that the number of known North American species of *Bembidion* will not substantially exceed 250.

TABLE 1

NORTH AMERICAN SPECIES OF BEMBIDION RECOGNIZED AT
DIFFERENT PERIODS (APPROXIMATE FIGURES)¹

	Listed	Synonyms	True Number
LeConte, 1948	42	7	35
LeConte, 1857	75	6	69
Hayward, 1897	124	4	120
Casey, 1918	> 324	119	< 205
Leng, 1920	373	137	< 236
Casey, 1924 (incl. 1918)	> 372	150	< 222
Leng, Suppl. 1, 1927	429	183	< 246
Leng, Suppl. 2-5, 1933-1948	433	187	< 246
Ball, 1960	395	137	< 258
Present state (incl. later additions by Lindroth, 1962-1964)	305	ca. 81 ²	ca. 224

¹Some of the figures, notably those referring to the Leng Catalogue, with supplements, are open to discussion. The use of incorrect or non-valid specific names sometimes prevent a definite interpretation.

²Supposed remaining undiscovered synonyms are counted as the equivalent of 84% of unrevised Casey species (see text).

LITERATURE CITED

- ARNETT, R. H., JR.
1965. Review: Ground-Beetles of Canada and Alaska. *Coleop. Bull.*, 19:23.
- BALL, G. E.
1960. Carabidae. In: ARNETT. *The Beetles of the United States*. 4. Washington, D. C., pp. 55-181.
- CASEY, T. L.
1918, 1924. *Memoirs on the Coleoptera*. VIII. XI. Lancaster, Pa., pp. 1-427, 1-347.
- FALL, H. C.
1910. Miscellaneous notes, etc. *Trans. American Ent. Soc.* 36. Philadelphia, pp. 89-197.
- HATCH, M. H.
1950. Studies on the Coleoptera of the Pacific Northwest. II. Carabidae: Bembidiini. *Pan-Pacific Ent.* 26. San Francisco, pp. 97-106.
1953. *The Beetles of the Pacific Northwest*. 1. Univ. Washington Publ. Biol. 16. Seattle, pp. 1-340.

HAYWARD, R.

1897. On the species of *Bembidium* of America north of Mexico. *Trans. American Ent. Soc.* 24. Philadelphia, pp. 32-158.

LECONTE, J. L.

1848. A descriptive catalogue of the Geodephagous Coleoptera, etc. *Ann. Lyc. Nat. Hist.* 4. New York, pp. 173-474.
1857. Catalogue of the species of *Bembidium*, etc. *Proc. Ac. Nat. Sci.* 7. Philadelphia, pp. 2-6.

LENG, C. W.

- 1920, 1927-48. Catalogue of the Coleoptera of America, north of Mexico, With 5 supplements. Mt. Vernon.

LINDROTH, C. H.

1954. Random notes on North American Carabidae (Coleopt.). *Bull. Mus. Comp. Zool.* 111:3. Cambridge, Mass., pp. 117-161.
1955. The Carabid Beetles of Newfoundland, etc. *Opusc. Ent., Suppl. XII.* Lund, pp. 1-160.
1962. Revision of the subgenus *Chrysobracteon* Net., etc. *Opusc. Ent.* 27. Lund, pp. 1-18.
1963. The Ground-Beetles of Canada and Alaska. 3. *Opusc. Ent., Suppl. XXIV.* Lund, pp. 201-408.
1965. Two new species of subg. *Chrysobracteon*, etc. *Opusc. Ent.* 30. Lund, pp. 125-128.

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Rather than accumulate a lot of separate short notes and announcements, as in the past, I plan to write a continuous column under the above title. Hopefully, this will be worthwhile as a source of news of activities of some general interest, and of specific interest to those working on beetles.

Acknowledgements. - Beginning in 1962 (volume 16) through 1966, (volume 20) my good friend T. J. Spilman edited the BULLETIN. During these five years, one quarter of its life, the journal matured and became of age. Many significant papers were published, and many of the authors publishing in those volumes are among the world's most productive entomologists. The highest editorial standards were set and maintained by Spilman, standards that will be hard to equal. The former editor had the constant aid of the editorial board, but as usual, the real burden was carried by Spilman. We all wish it were possible for him to continue, but many miles now separate his office and the new editorial office of the BULLETIN. I know all of the Coleopterists who use the BULLETIN join with me in thanking Spilman and the old board for the good job they did.

The CUA Press carried on the business activities of the BULLETIN from 1959 (volume 13) through volume 20. They contributed substantially by furnishing office space and maintaining without cost, all of the publishing chores needed to run the journal. They still hold and will supply back issues through volume 20. This help contributed the first years of financial stability for the BULLETIN, for which we are grateful. We are sorry that changing interests at Catholic University prohibited us from continuing this association and we thank the CUA Press for sending the BULLETIN on with us to PURDUE UNIVERSITY.